Sampling and Nonsampling Errors

This section discusses methods for computing sampling errors and highlights major sources of nonsampling error in SIPP.

- *Computing Sampling Error*
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  - *Approximate Variance Estimation*
- *Sources of Nonsampling Error*
  - *Differential Undercoverage*
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Computing Sampling Error

Analysts often mistakenly ignore a survey's complex design and treat the sample as a simple random sample (SRS) of the population. If analysts apply SRS formulas for variances to SIPP estimates, they will typically underestimate the true variances.

The following approaches are useful in obtaining variances for SIPP estimates.

Direct Variance Estimation

The SIPP data files contain primary sampling unit (PSU) and stratum variables that were created for the purpose of variance estimation. When analysts use these variables with software designed for complex surveys, they can calculate appropriate variances of survey estimates.

1990–1993 Panels. In the public use data files, analysts should look for the following variable names for the variance stratum and variance unit codes associated with each sample member:

- HHSC and HSTRAT in the core wave files
- HALFSAMP and VARSTRAT in the full panel files

These codes can be used in any of the software packages for variance estimation with complex sample designs.

1996 Panel. For the 1996 Panel, analysts should use Fay's method for estimating variances. This modified balanced repeated replication method allows the use of both halves of the sample. Thus, no subset of the sample units in a particular classification will be totally excluded.

The variance formula for Fay's method is presented and discussed in Chapter 7 of the *SIPP Users' Guide*.

Approximate Variance Estimation

The Census Bureau provides two forms for approximate variance estimation:

- Generalized variance functions (GVFs), which are updated annually
- Tables of standard errors for different estimated numbers and percentages

The use of GVFs and tables of standard errors is described in the source and accuracy statement included with each data file. Examples of their use appear in Chapter 7 of the *SIPP Users' Guide*.

Sources of Nonsampling Error

A full discussion of nonsampling errors in SIPP is presented in the third edition of the *SIPP Quality Profile* (available at the SIPP Web site). In this tutorial, we briefly describe three broad sources of nonsampling error.

Differential Undercoverage

One source of error in SIPP is differential undercoverage of demographic subgroups, particularly young adult black males. Undercoverage in SIPP is due mainly to omissions within households rather than to omissions of entire households.

To compensate for undercoverage, the Census Bureau uses known population controls to adjust SIPP weights.

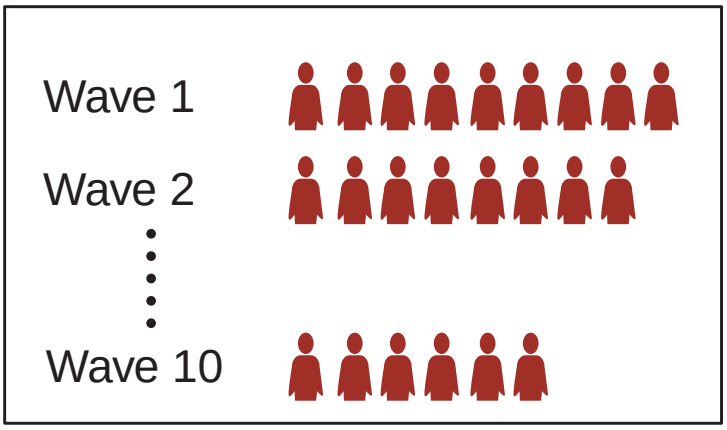
Nonresponse

Nonresponse is a major concern in SIPP because of the need to follow the same people over time. In SIPP, nonresponse can occur at several levels:

- Household nonresponse at the first wave and thereafter
- Person nonresponse in interviewed households
- Item nonresponse, including complete nonresponse to topical modules

Nonresponse reduces the effective sample size, thereby increasing sampling error, and may bias the survey estimates.

The Census Bureau uses weighting and imputation methods to reduce the potential biasing effects of nonresponse (see Chapters 4, 5, and 8 of the *SIPP Users' Guide*).



Measurement Errors

Measurement errors occur during data collection and processing. They may vary across SIPP panels because of changes in data collection procedures. For example, SIPP switched from total face-to-face interviews in the early panels to a mix of telephone and face-to-face interviews since February 1992.

Response errors in SIPP include:

- Errors of recall
- Errors in proxy respondents' reports
- Errors associated with respondents' misinterpretation of questions
- Errors associated with the panel nature of SIPP

To reduce memory error, SIPP uses a relatively short recall period of 4 months for most questions. Also, interviewers encourage respondents to use financial records and event calendars to facilitate recall.

Two special sources of response error arise from the panel nature of SIPP:

- **The Time-in-Sample Effect (or Panel Conditioning).** This effect refers to the tendency of sample members to "learn the survey" over time. The concern is that sample members will alter their responses in an effort to conceal sensitive information or to shorten the length of the interview.

- **The Seam Phenomenon.** Research has consistently shown that SIPP respondents tend to report the same status (e.g., program participation) and the same amounts (e.g., Social Security income) for all 4 months within a wave. Thus, most changes in status are reported to occur between the last month of one wave and the first month of the next wave, which is the seam between the two waves.

  The seam phenomenon results in an overstatement of changes at the on-seam months and an understatement of changes at the off-seam months. tip

Effects of Nonsampling Error on Survey Estimates

Despite extensive research on nonsampling error in SIPP, it is difficult to quantify the combined effects of nonsampling error on SIPP estimates. A full discussion of this issue appears in the *SIPP Quality Profile*.

Some of the research findings that users should keep in mind when conducting their analyses and examining the results include the following:

- Demographic subgroups underrepresented in SIPP include:
  - Young black males
  - Metropolitan residents
  - Renters
  - People who changed addresses during a panel
  - People who were divorced, separated, or widowed

  Census Bureau adjustments to correct the underrepresentation may not fully address potential biases.
- Differences exist between SIPP and CPS estimates of the working population, people without any health insurance coverage, and, for pre-1996 panels, people in poverty.

SIPP *tip*

Because of the rotation group design used in SIPP, the seam phenomenon has relatively small effects on cross-sectional estimates based on all four rotation groups. Its effects on longitudinal estimates are not well known.

- SIPP estimates of interest and dividend income are prone to error and tend to be underreports. SIPP estimates of assets, liabilities, and wealth are low relative to estimates from the Federal Reserve Board.
- Compared with estimates based on administrative records, SIPP estimates of income from Social Security, Railroad Retirement, and Supplemental Security programs are similar, but SIPP estimates of unemployment income, worker's compensation income, veteran's income, and public assistance income are low.
- SIPP and CPS estimates of number of births are comparable, but are low relative to records from the National Center for Health Statistics.